CLAIMS

What is claimed is:

1. A phase shift photomask comprising:

a transparent substrate;

a patterned opaque material layer formed upon the transparent substrate to define a non-transmissive region of the transparent substrate aligned beneath the patterned opaque material layer and an adjoining transmissive region of the transparent substrate not aligned beneath the patterned opaque material layer, wherein the transmissive region has formed therein a pit having a stepped sidewall.

2. The phase shift photomask of claim 1 wherein the stepped sidewall comprises a minimum of one arc shaped step.

3. The phase shift photomask of claim 1 wherein the pit has one stepped sidewall and one non-stepped sidewall.

4. The phase shift photomask of claim 1 wherein the stepped sidewall comprises from about three to about ten steps.

5. The phase shift photomask of claim 1 wherein an overall depth of the pit having the stepped sidewall provides for a 180 degree phase change of photoexposure radiation.

6. The phase shift photomask of claim 1 further comprising a second transmissive region on an opposite side of the non-transmissive region from the transmissive region, where the second transmissive region does not have formed therein a pit.

7. A method for fabricating a phase shift photomask comprising:

providing a transparent substrate;

forming upon the transparent substrate a patterned opaque material layer;

sequentially and repetitively:

isotropically etching the transparent substrate at a location not covered by the patterned opaque material layer; and

laterally etching the patterned opaque material layer, to form a non-transmissive region of the transparent substrate beneath a multiply laterally etched patterned opaque material layer and an adjoining transmissive region of the transparent substrate not beneath the multiply laterally etched patterned opaque material layer, where the transmissive region of the transparent substrate has formed therein a pit having a stepped sidewall.

8. The method of claim 7 wherein the stepped sidewall comprises a minimum of one arc shaped step.

9. The method of claim 7 wherein the pit has one stepped sidewall and one non-stepped sidewall.

10. The method of claim 7 wherein the stepped sidewall comprises from about three to about ten steps.

11. The method of claim 7 wherein an overall depth of the pit having the stepped sidewall provides for a 180 degree phase change of photoexposure radiation.

12. The method of claim 7 wherein the transparent substrate further comprises a second transmissive region on an opposite side of the non-transmissive region from the transmissive region, where the second transmissive region does not have formed therein a pit.

13. The method of claim 7 wherein the sequential and repetitive isotropic etching of the transparent substrate and lateral etching of the patterned opaque material layer is undertaken in a self aligned fashion.

14. A method for fabricating a phase shift photomask comprising:

providing a transparent substrate;

forming upon the transparent substrate a laterally progressing series of patterned opaque material layers;

sequentially and repetitively:

isotropically etching the transparent substrate at a location not covered by the laterally progressing series of patterned opaque material layers; and

laterally progressively stripping the laterally progressing series of patterned opaque material layers, to form

a non-transmissive region of the transparent substrate beneath a remaining non-stripped patterned opaque material layer and an adjoining transmissive region of the transparent substrate not beneath the remaining non-stripped patterned opaque material layer, where the transmissive region of the transparent substrate has formed therein a pit having a stepped sidewall.

15. The method of claim 14 wherein the stepped sidewall comprises a minimum of one arc shaped step.

16. The method of claim 14 wherein the pit has one stepped sidewall and one non-stepped sidewall.

17. The method of claim 14 wherein the stepped sidewall comprises from about three to about ten steps.

18. The method of claim 14 wherein an overall depth of the pit having the stepped sidewall provides for a 180 degree phase change of photoexposure radiation.

19. The method of claim 14 wherein the transparent substrate further comprises a second transmissive region on an opposite side of the non-transmissive region from the transmissive region, where the second transmissive region does not have formed therein a pit.

20. The method of claim 14 wherein the laterally progressing series of patterned opaque material layers is formed employing a single lithographic process step.